

**We Claim:**

1           1.     A material comprising a proteinaceous prepolymer comprising first reactive  
2 groups and a synthetic prepolymer comprising second reactive groups, at least a portion of said  
3 first reactive groups being reacted with said second reactive groups.

1           2.     The material of claim 1 selected from the group consisting of a compatibilized  
2 copolymer and a compatibilized interpenetrating network.

1           3.     The material of claim 2 wherein said portion is effective to provide said material  
2 with durability and adhesion.

1           4.     The material of claim 3 wherein said portion comprises first reactive groups  
2 covalently bonded to said second reactive groups.

1           5.     A material comprising keratin comprising first reactive groups and a synthetic  
2 prepolymer comprising second reactive groups, at least a portion of said first reactive groups  
3 being reacted with said second reactive groups.

1           6.     The material of claim 2 wherein said proteinaceous prepolymer comprises keratin.

1           7.     The material of claim 3 wherein said proteinaceous prepolymer comprises keratin.

1           8.     The material of claim 4 wherein said proteinaceous prepolymer comprises keratin.

1           9.     The material of claim 5 wherein said keratin is derived from hair.

1           10.    The material of claim 6 wherein said keratin is derived from hair.

1           11.    The material of claim 7 wherein said keratin is derived from hair.

- 1           12.    The material of claim 8 wherein said keratin is derived from hair.
- 1           13.    The material of claim 9 wherein said hair is human hair.
- 1           14.    The material of claim 10 wherein said hair is human hair.
- 1           15.    The material of claim 11 wherein said hair is human hair.
- 1           16.    The material of claim 12, wherein said hair is human hair.
- 1           17.    The material of claim 5 wherein said keratin is derived from a source selected  
2 from the group consisting of skin, beaks, feet, horns, hooves or feathers.
- 1           18.    A material comprising a proteinaceous prepolymer comprising first reactive  
2 groups and at least one silicone comprising second reactive groups, at least a portion of said first  
3 reactive groups being reacted with to said second reactive groups.
- 1           19.    The material of claim 2 wherein said synthetic prepolymer is at least one silicone.
- 1           20.    The material of claim 3 wherein said synthetic prepolymer is at least one silicone.
- 1           21.    The material of claim 4 wherein said synthetic prepolymer is at least one silicone.
- 1           22.    A material comprising keratin comprising first reactive groups and at least one  
2 silicone comprising second reactive groups, at least a portion of said first reactive groups being  
3 reacted with said second reactive groups.
- 1           23.    The material of claim 6 wherein said synthetic prepolymer is at least one silicone.
- 1           24.    The material of claim 7 wherein said synthetic prepolymer is a silicone.

- 1        25.    The material of claim 8 wherein said synthetic prepolymer is at least one silicone.
- 1        26.    The material of claim 9 wherein said synthetic prepolymer is at least one silicone.
- 1        27.    The material of claim 10 wherein said synthetic prepolymer is at least one  
2 silicone.
- 1        28.    The material of claim 11 wherein said synthetic prepolymer is at least one  
2 silicone.
- 1        29.    The material of claim 12 wherein said synthetic prepolymer is at least one  
2 silicone.
- 1        30.    The material of claim 13 wherein said synthetic prepolymer is at least one  
2 silicone.
- 1        31.    The material of claim 14 wherein said synthetic prepolymer is at least one  
2 silicone.
- 1        32.    The material of claim 15 wherein said synthetic prepolymer is at least one  
2 silicone.
- 1        33.    The material of claim 16 wherein said synthetic prepolymer is at least one  
2 silicone.
- 1        34.    The material of claim 1 wherein said functionalized synthetic prepolymer is  
2 selected from the group comprising thermoplastics and thermosets.

1        35.     The material of claim 34 wherein said thermoplastics are selected from the group  
2 consisting of polyesters, polycarbonates, polyolefins, polyethers, polysulfones, and urethanes.

1        36.     The material of claim 2 wherein said functionalized synthetic prepolymer is  
2 selected from the group comprising thermoplastics and thermosets.

1        37.     The material of claim 36 wherein said thermoplastics are selected from the group  
2 consisting of polyesters, polycarbonates, polyolefins, polyethers, polysulfones, and urethanes.

1        38.     The material of claim 3 wherein said functionalized synthetic prepolymer is  
2 selected from the group comprising thermoplastics and thermosets.

1        39.     The material of claim 38 wherein said thermoplastics are selected from the group  
2 consisting of polyesters, polycarbonates, polyolefins, polyethers, polysulfones, and urethanes.

1        40.     The material of claim 5 wherein said functionalized synthetic prepolymer is  
2 selected from the group comprising thermoplastics and thermosets.

1        41.     The material of claim 40 wherein said thermoplastics are selected from the group  
2 consisting of polyesters, polycarbonates, polyolefins, polyethers, polysulfones, and urethanes.

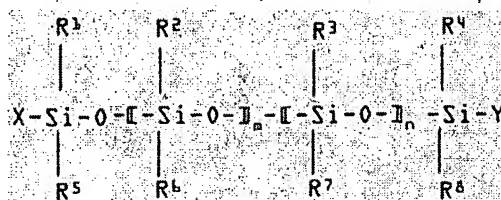
1        42.     The material of claim 18 wherein said silicone is a mercapto-functional silicone.

1        43.     The material of claim 22 wherein said silicone is a mercapto-functional silicone.

1        44.     The material of claim 18 wherein said silicone is a vinyl-functional silicone.

1        45.     The material of claim 22 wherein said silicone is a vinyl-functional silicone.

46. The material of claim 18 wherein said silicone has the following general structure:



wherein

m is from about 5 molar% to about 95 molar%;

n is from about 95 molar% to about 5 molar%; and,

X, Y, R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, and R<sup>8</sup> independently are selected from the group consisting of reactive groups, alkyl groups having from about 1 to about 3 carbon atoms, phenyl groups, and perfluoro groups having from about 1 to about 3 carbon atoms;

provided that,

at least one of X, Y, R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, and R<sup>8</sup> is a reactive group, most preferably

at least one of X, Y, R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> are reactive groups;

no more than one of X, R<sup>1</sup>, and R<sup>5</sup> is a reactive group;

and, no more than one of Y, R<sup>4</sup>, and R<sup>8</sup> is a reactive group.

47. The material of claim 46 wherein R<sup>1</sup>, R<sup>4</sup>, R<sup>5</sup>, and R<sup>8</sup> independently are selected from the group consisting of methyl groups, ethyl groups, and phenyl groups.

48. The material of claim 46 wherein X and Y are selected from the group consisting of methyl groups and vinyl groups.

49. The material of claim 47 wherein X and Y are selected from the group consisting of methyl groups and vinyl groups.

1           50.    The material of claim 46 wherein at least one of X, Y, R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> is  
2    selected from the group consisting of a reactive vinyl group and a reactive thiol group.

1           51.    The material of claim 46 wherein R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> comprise reactive groups  
2    selected from the group consisting of reactive vinyl groups and reactive thiol groups.

1           52.    The material of claim 46 wherein at least one of R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> is selected  
2    from the group consisting of a thiol terminated pendant group and a vinyl terminated pendant  
3    group.

1           53.    The material of claim 52 wherein at least one of R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> is selected  
2    from the group consisting of an *n*-alkylthiol pendant group comprising an alkyl group having  
3    from about 1 to about 3 carbon atoms.

1           54.    The material of claim 47 wherein at least one of R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> is selected  
2    from the group consisting of a thiol terminated pendant group and a vinyl terminated pendant  
3    group.

1           55.    The material of claim 54 wherein at least one of R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> is selected  
2    from the group consisting of an *n*-alkylthiol pendant group comprising an alkyl group having  
3    from about 1 to about 3 carbon atoms.

1           56.    The material of claim 48 wherein at least one of R<sup>2</sup>, R<sup>6</sup>, R<sup>3</sup>, and R<sup>7</sup> is selected  
2    from the group consisting of a thiol terminated pendant group and a vinyl terminated pendant  
3    group.

1        57. The material of claim 56 wherein at least one of  $R^2$ ,  $R^6$ ,  $R^3$ , and  $R^7$  is selected  
2 from the group consisting of an *n*-alkylthiol pendant group comprising an alkyl group having  
3 from about 1 to about 3 carbon atoms.

1        58. The material of claim 49 wherein at least one of  $R^2$ ,  $R^6$ ,  $R^3$ , and  $R^7$  is selected  
2 from the group consisting of a thiol terminated pendant group and a vinyl terminated pendant  
3 group.

1        59. The material of claim 58 wherein at least one of  $R^2$ ,  $R^6$ ,  $R^3$ , and  $R^7$  is selected  
2 from the group consisting of an *n*-alkylthiol pendant group comprising an alkyl group having  
3 from about 1 to about 3 carbon atoms.

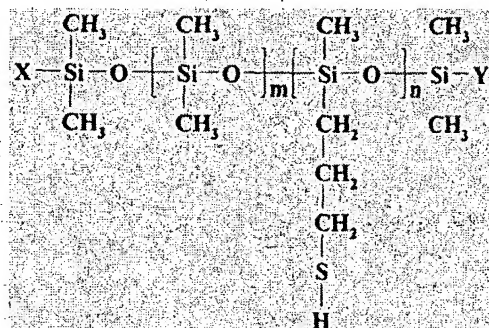
1        60. The material of claim 50 wherein at least one of  $R^2$ ,  $R^6$ ,  $R^3$ , and  $R^7$  is selected  
2 from the group consisting of a thiol terminated pendant group and a vinyl terminated pendant  
3 group.

1        61. The material of claim 60 wherein at least one of  $R^2$ ,  $R^6$ ,  $R^3$ , and  $R^7$  is selected  
2 from the group consisting of an *n*-alkylthiol pendant group comprising an alkyl group having  
3 from about 1 to about 3 carbon atoms.

1        62. The material of claim 51 wherein at least one of  $R^2$ ,  $R^6$ ,  $R^3$ , and  $R^7$  is selected  
2 from the group consisting of a thiol terminated pendant group and a vinyl terminated pendant  
3 group.

63. The material of claim 62 wherein at least one of  $R^2$ ,  $R^6$ ,  $R^3$ , and  $R^7$  is selected from the group consisting of an *n*-alkylthiol pendant group comprising an alkyl group having from about 1 to about 3 carbon atoms.

64. The material of claim 18 wherein said silicone has the following general structure:



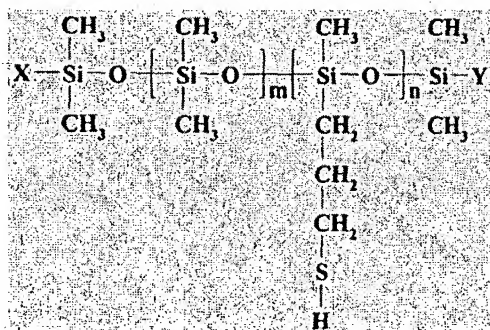
wherein

*m* is from about 5 molar% to about 95 molar%;

*n* is from about 95 molar% to about 5 molar%; and,

X and Y independently are selected from the group consisting of methyl groups, hydroxyl groups, and combinations thereof.

65. The material of claim 22 wherein said silicone has the following general structure:

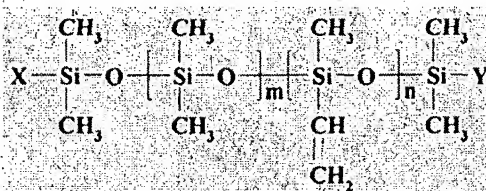


wherein



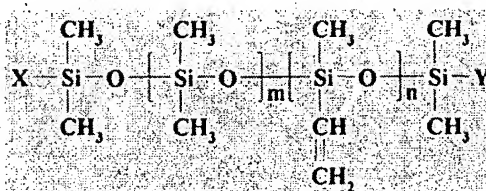
m is from about 5 molar% to about 95 molar%;  
 n is from about 95 molar% to about 5 molar%;  
 and, X and Y independently are selected from the group consisting of methyl groups, hydroxyl groups, and combinations thereof.

66. The material of claim 18 wherein said silicone has the following general structure:



wherein  
 m is from about 5 molar% to about 95 molar%;  
 n is from about 95 molar% to about 5 molar%; and,  
 X and Y independently are selected from the group consisting of methyl groups, hydroxyl groups, and combinations thereof.

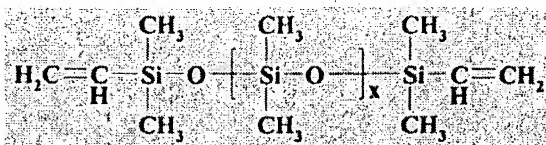
67. The material of claim 22 wherein said silicone has the following general structure:



wherein  
 m is from about 5 molar% to about 95 molar%;  
 n is from about 95 molar% to about 5 molar%; and,

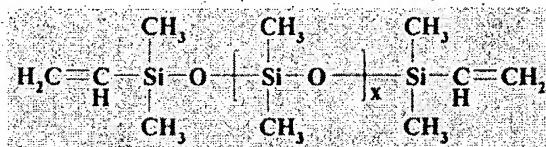
X and Y independent are selected from the group consisting of methyl groups, hydroxyl groups, and a combination thereof.

68. The material of claim 18 wherein said silicone has the following general structure:



wherein x is from about 1 to about 3000.

69. The material of claim 22 wherein said silicone has the following general structure:



wherein x is from about 1 to about 3000.

70. A medical implant comprising the material of claim 1.

71. A medical implant comprising the material of claim 5.

72. A medical implant comprising the material of claim 18.

73. A medical implant comprising the material of claim 22.

74. A medical implant comprising the material of claim 46.

75. A wound dressing comprising the material of claim 1.

76. A wound dressing comprising the material of claim 5.

77. A wound dressing comprising the material of claim 18.

1            78.    A wound dressing comprising the material of claim 22.

1            79.    A wound dressing comprising the material of claim 46.

1            80.    The medical implant of claim 70 selected from the group consisting of orbital  
2 floor implants; contact lenses; hydrocephalus shunts; chin implants; tracheostomy vents; tracheal  
3 stems; breast prostheses; heart valves; finger joints; pacemaker leads; intra-aortic balloon pumps;  
4 ureteral stems; oviductal plugs; testicular prostheses; penile prostheses; tibial cups; toe joints;  
5 vaginal stems; urethral cuffs; hip implants; knee implants; gluteal pads; antireflux cuffs; artificial  
6 skin; extracorporeal blood oxygenators; wrist joints; ear frames; eustachian tubes; maxillofacial  
7 implants; and catheters.

1            81.    The medical implant of claim 71 selected from the group consisting of orbital  
2 floor implants; contact lenses; hydrocephalus shunts; chin implants; tracheostomy vents; tracheal  
3 stems; breast prostheses; heart valves; finger joints; pacemaker leads; intra-aortic balloon pumps;  
4 ureteral stems; oviductal plugs; testicular prostheses; penile prostheses; tibial cups; toe joints;  
5 vaginal stems; urethral cuffs; hip implants; knee implants; gluteal pads; antireflux cuffs; artificial  
6 skin; extracorporeal blood oxygenators; wrist joints; ear frames; eustachian tubes; maxillofacial  
7 implants; and catheters.

1            82.    The medical implant of claim 72 selected from the group consisting of orbital  
2 floor implants; contact lenses; hydrocephalus shunts; chin implants; tracheostomy vents; tracheal  
3 stems; breast prostheses; heart valves; finger joints; pacemaker leads; intra-aortic balloon pumps;  
4 ureteral stems; oviductal plugs; testicular prostheses; penile prostheses; tibial cups; toe joints;  
5 vaginal stems; urethral cuffs; hip implants; knee implants; gluteal pads; antireflux cuffs; artificial

6 skin; extracorporeal blood oxygenators; wrist joints; ear frames; eustachian tubes; maxillofacial  
7 implants; and catheters.

1 83. The medical implant of claim 73 selected from the group consisting of orbital  
2 floor implants; contact lenses; hydrocephalus shunts; chin implants; tracheostomy vents; tracheal  
3 stems; breast prostheses; heart valves; finger joints; pacemaker leads; infra-aortic balloon pumps;  
4 ureteral stems; oviductal plugs; testicular prostheses; penile prostheses; tibial cups; toe joints;  
5 vaginal stems; urethral cuffs; hip implants; knee implants; gluteal pads; antireflux cuffs; artificial  
6 skin; extracorporeal blood oxygenators; wrist joints; ear frames; eustachian tubes; maxillofacial  
7 implants; and catheters.

1 84. The medical implant of claim 74 selected from the group consisting of orbital  
2 floor implants; contact lenses; hydrocephalus shunts; chin implants; tracheostomy vents; tracheal  
3 stems; breast prostheses; heart valves; finger joints; pacemaker leads; infra-aortic balloon pumps;  
4 ureteral stems; oviductal plugs; testicular prostheses; penile prostheses; tibial cups; toe joints;  
5 vaginal stems; urethral cuffs; hip implants; knee implants; gluteal pads; antireflux cuffs; artificial  
6 skin; extracorporeal blood oxygenators; wrist joints; ear frames; eustachian tubes; maxillofacial  
7 implants; and catheters.

1 85. The material of claim 1 wherein said proteinaceous prepolymer is selected from  
2 the group consisting of collagen, fibrin, and a growth factor.

1 86. The material of claim 18 wherein said proteinaceous prepolymer is selected from  
2 the group consisting of collagen, fibrin, and a growth factor.

1           87.     The material of claim 22 wherein said proteinaceous prepolymer is selected from  
2     the group consisting of collagen, fibrin, and a growth factor.

1           88.     The material of claim 46 wherein said proteinaceous prepolymer is selected from  
2     the group consisting of collagen, fibrin, and a growth factor.

1           89.     A method comprising: providing proteinaceous prepolymers comprising at least  
2     one first reactive group; providing synthetic prepolymers comprising at least one second reactive  
3     group; and reacting said first and said second reactive groups.

1           90.     The method of claim 89 wherein said proteinaceous prepolymer comprises  
2     keratin.

1           91.     The method of claim 89 wherein said synthetic prepolymer is at least one silicone.

1           92.     The method of claim 90 wherein said synthetic prepolymer is at least one silicone.